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NATURAL ZEOLITE PRODUCTION

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Zeolite is 100% Natural Materials



Zeolite minerals are known as aluminum silicate, mainly sodium, calcium minerals and water. They are naturally formed from the interaction of ground water with volcanic rocks or clay minerals.

Zeolite is made up of a group of natural minerals that are very useful in agricultural, industrial and environmental fields. Modern agriculture is witnessing wide uses of zeolite due to chemical and physical properties.

The zeolite ores in the Hashemite Kingdom of Jordan are located in many areas from the north east to the south and discovered on the surface, it is close to the roads in most geological discoveries. The Jordanian zeolite ores are characterized by its high purity and its large reserves (quality and quantity).

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Characteristics of Zeolite

- High speed in absorption of water, gases and steaming (high evaporation).
- The filtration result strength of spaces forming high porosity and low density.
- The high-charge positive and exchange capacity of ions is three times that of clay minerals.
- Control the level of alkali in all state.
- Control the natural and chemical quantities of the biochemical dissolved oxygen.
- Increase the surface area of granular surface.
- Combining absorption and adsorption processes.
- Control the pH of the water inside the soil.
- Absorption of heavy metals from water and soil such as lead, iron, mercury, tin and manganese…



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The Main Uses of Zeolite

Agricultural Uses



- It is used as natural fertilizer to increase the yield of agricultural crops
- Used as a soil conditioner to modify its chemical and physical properties.
- Saving irrigation water consumption in irrigated agriculture by 35-50%.
- Used in feed mixtures for feeding animals, poultry and fish
- Used as agricultural pesticides and veterinary medicines.
- Used to remove odors from animals and birds.

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The Main Uses of Zeolite

Industrial Uses



- Manufacture of chemical detergents, washing powder and cleaning paste.
- Introduces glass, rubber and paper industry.
- Lightweight cement industry.
- Enter into the electronic equipment industry as a compass for moisture.
- Enter into porcelain industry.
- Puri□cation of natural gas and oil from moisture in wells and oil re□neries.

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The Main Uses of Zeolite

Environmental Uses



- Treatment of waste and atomic electrolytes.
- Purify drinking water and clean water tanks from harmful metal electrolytes.
- Treatment of metal waste.
- Treatment of metal waste.
- Control odors.

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Bene□ts of Zeolite in Agriculture

- Reclaim the poor sandy lands in clay minerals with Zeolite and increase their cohesion and reduce the quantities of water and fertilizers lost.
- Zeolite helps to improve clay soil structure and increase its permeability.
- Zeolite used as fertilizer that controls the extension of soil as needed through the slow launch of the elements necessary to feed plants.
- Zeolite is characterized by high porosity, as it stabilizes ammonia, potassium, calcium, magnesium and other nutrients within these spaces and pores to feed the plant when needed.
- Reducing the amount of irrigation water in agriculture as most of the countries in the region suffer from water scarcity and the use of natural Zeolite reduces the amount of irrigation water by an estimated (35- 50) %.
- The addition of Zeolite to soil reduces the consumption of chemical fertilizers, protects the groundwater from pollution and reduces the loss of fertilizers, leading to the long-term effectiveness of fertilizers for decades.

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Bene□ts of Zeolite in Agriculture

- Zeolite increasing the production quantities of crops where studies and research in various countries of the world proved that the addition of natural zeolite to the soil leads to increase the production of agricultural crops as follows:

Agricultural Yield %	Minimum Increase%	Maximum Increase%
Wheat	13	15
Barley	30	50
Rice	27	70
Corn	18	36
Tomatoes	15	20
Potatoes	12	30
Apple	19	55
Egg plant	13	38
Islands	13	38

- The used method is mixing natural Zeolite with soil in the root area for agriculture, according to the following quantities:

Plant	Unit	Zeolite Dosage Kg/unit
Palm Trees	Tree	35-50 Depending on root depth
Fruit Trees	Tree	20-30 Depending on root depth
Fruitless Trees	Tree	15-25 Depending on root depth
Vegetables	m^2	3-5 Depending on soils type
Flowers	m^2	2-3 Depending on soils type
Grass	m^2	3-5 Depending on soils type

- The production of Zeolite added to the soil increases the proportion of vitamins, grains size and gives the plant immunity from diseases.

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Zeolite with Fertilizers

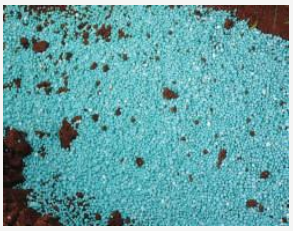
- Zeolite is an excellent soil amendment & fertilizer carrier. It holds nitrogen as ammonium, it has a high potash content (approximately 3.47%), no water soluble sodium, holds over 55% of its weight in water and reduces soil weight up to 2%.

Zeolite ability to load with 1.8 to 2.1% nitrogen in the form of ammonium in its crystal structure makes it excellent for fertilizer applications. The nitrogen is not water-soluble, but it is plant accessible. It holds the nitrogen in the root zone of the plant and releases it gradually as needed for growth. Nitrogen is used efficiently and reduced groundwater contamination.

- The use of Zeolite with the amount of organic or chemical fertilizer leads to the length of the effectiveness of these fertilizers and their survival in the soil.
- Manure remains with Zeolite in the upper layer of soil, which benefit the plant directly without losing any of them.



Organic Fertilizer



Chemical Fertilizer

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Zeolite in Greenhouses with Manure

1. Use Zeolite in green houses and manure with a layer of 2530- cm thickness, through the following mixture: Zeolite 70% + 20% natural fertilizer + 10% sawdust. This leads to increase in production from 20 -100%.

2. Depending on the type of plantations, tomato ripens quickly before its time by about two weeks and a significant increase in production and increase in vitamin 2 to 30%.

3. In most cases, Zeolite is used about 510- tons per hectare.

Zeolite Used in Aquaculture

Zeolite is used as a substitute for peatmoss, gravel or coarse sand. It is an inert material that does not benefit the plant like zeolite, which is a natural nutrient for the plant and increases production and at the same time prevents plant infestation of diseases that may be gained from agriculture using natural soil



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Zeolite Used in Feed Pet Animals

1. Add Zeolite by 1 - 1.5 % to animal feed of sheep pens, cows and camels lead to increased weight for the same time period 25 - 40% and reduce the proportion of fat 15%

2. Add Zeolite to animal feed preserve the embryos and lead to the birth of twins and increase the weight (fetus) within four months of (1 - 1.4) kg.

3. Feeding animals with Zeolite mixtures yields a light-colored meat of calves and sheep and increases milk production by 17%.

4. Zeolite is characterized by its high ability to absorb ammonia from waste and excess food in animal pens.

5. Adding Zeolite to animal food reduces the mortality rate, preventing it from infectious ulcer and heart enlargement, reducing the use of antibiotics and the value of drugs used in treatment.



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Zeolite Used in the Poultry

Zeolite used in the poultry food mixture preserves the fodder from damage for a long time. It is added directly to feed mixtures with 0.81.0- kg Zeolite per ton of feed.

Zeolite mixed with bird and animal droppings can be used to convert it into highly efficient fertilizers and in a very short period of time.

Zeolite used to improve the quality of eggs (thick crust is difficult to break and larger size and more) and increase the production of eggs 15% and reduce the consumption of feed by 20%.

Zeolite is used to clean hides without water.

Zeolite used increases the weight and size of the bird when adding 11.5%- zeolite for fodder leads to an increase in the weight of birds 1520%- for the same period of time.

Zeolite used in the skimmer absorbs odors.

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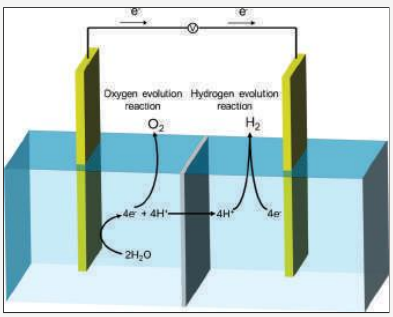
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Zeolite Used in Fish Farming



- Add Zeolite to fish ponds to purify water from ammonia causing diseases of fish, including gills, growth, brain damage, infertility and death.
- Prolongs the metabolic period, which makes fish benefit most from feed.
- Strengthens the immunity of fish and opens the appetite and increases the activity and vitality of fish, leading to an increase in fish weight about 25%.
- Gives the hardness and strength of the feed, which leads to the length of his stay in water.
- Control alkalinity of water and hydrogen by eliminating hydrogen supplied and nitrite gas.
- Remover of excess aches and smells of ponds of education.





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Zeolite in Absorption of Odors

- Zeolite is used to control odors caused by animal husbandry in homes and barns. Ammonia and moisture from animals are absorbed by Zeolite exchange, especially from the breeding of cats and dogs in residential homes. Experiments have shown that Zeolite has the ability to continue in the absorption of odors for a period of between 50 - 60 days. Zeolite is characterized by the ability to renew the energy, which can be used more than once by drying.





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Industrial Zeolite Uses

- Zeolite uses in the purification of natural gas. It has potential to separate some gases in oil wells and refineries such as water vapor, carbon dioxide, sulfur dioxide and methane gas in the ground pockets... Each gram of Zeolite works to remove 200 milligrams of sulfur dioxide and is also used to separate and purify gas mixtures.



- Zeolite used as additional materials for the production of lightweight concrete and Portland cement due to its high ability to interact with lime.

- Zeolite used in petroleum refining operations and the separation of crude oil components into usable compounds for different purposes. By breaking the components of the crude into its original molecules through the distillation process through the distillation tower and filtering each of its components (gasoline, diesel, jet fuel, cars, white oil, bitumen, etc.), so Zeolite is used as a catalyst for some important reactions in the petrochemical field.

- Zeolite used in pharmaceutical industries such as ointments, cures and antibiotics, also used in the work of structures of dental materials and some materials used as replacement prostheses for bones.

- Zeolite used in the basic materials for the manufacture of washing powders where it enters the powder mixture by about 2530%- basically, in substitute for Trisodium polyphosphate.

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Environmental Zeolite Uses

Zeolite is used in filters manufacture & water, it used in juice and dairy plants for their ability to separate solutions at the molecular scale, thus separating the particles of impurities from the juice materials and the butter particles from the milk. It used as filters in the following purification:

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1. Filtration and puri□cation of drinking water and wastewater

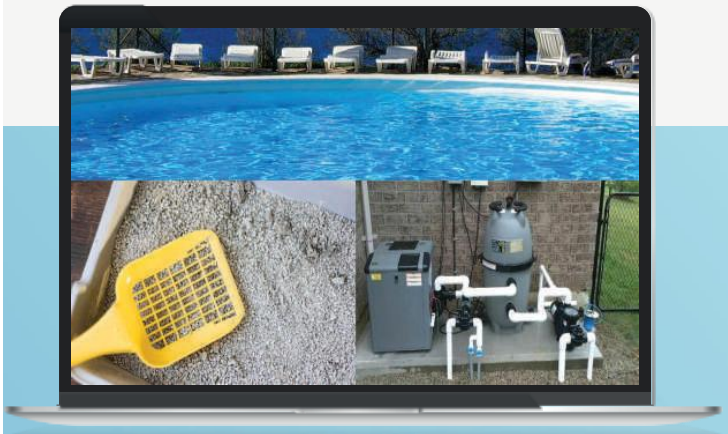
- Zeolite works to purify drinking water from harmful metal electrolytes and heavy metals and remove nickel, lead, carbon, ammonia, adsorption and absorption of lost and uncontrolled electrolytes in water.
- Desalination of hard water by cation exchange of the calcium & magnesium elements causing water age and replacing them with dissolved sodium element, causing the water to shift from hard to soft.
- Used as an alternative to sand material in the treatment of drinking water plants.
- Fuels remove radioactive elements, pathogens, nitrogen, some organic substances, hydrocarbons and many other pollutants.
- Removes water turbidity and reduces it significantly with a filtration rate of less than 5 microns. It can be used to purify and reduce the level of pollution and dirt in water of beaches caused by spills of oil, and other contaminants.
- Treatment of industrial waste water contaminated with heavy elements and removal of the oil spill from the water before it is put into the sewage and transferred to the soil, leading to pollution and pollution of groundwater and surface.



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2. Puri□cation and □ltration of pond water and swimming pools

- Zeolite eliminates chemical, organic and alkali contaminants from pool water and filters materials up to 3- 5 microns. The 25-pound bag of Zeolite contains granular surface of more than 50 football fields, while the 50-pound sand bag covers only one football field.
- Using zeolite as an alternative material is more effective than using sand in swimming pools because of the many physical and chemical properties of the zeolite active in the purification and filtering of swimming pool water.



- Zeolite reduces use of chlorine due to exchange of ammonium from the urine directly into the crystalline network where it is not soluble in water, which reduces the chlorination level.
- Reduces reverse washing time by up to 50% higher load capacity than sand.
- Reduces eye irritation due to use of less chlorine.

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Zeolite Uses Against Nuclear Disasters

Zeolite used

as a basic material for the disposal of radioactive effects and atomic and nuclear pollutants, especially when these pollutants seep into the air as a result of nuclear explosions in the atmosphere, or seep into the groundwater, and rivers as a result of the discharge of nuclear and nuclear contaminants,

Zeolite used

Radiation pollutants from radioisotopes used in scientific research, hydroelectric power stations and hospitals, some of which leak through the sewage to the water.

Zeolite used

Atomic waste buried in the earth or the deep sea and the resulting harmful radiation such as gamma rays and alpha, which may seep into those wastes to the water, especially when ground movements or explosions in the ground.



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Zeolite Products

Natural ZeoFarm

It used in improving the physical and chemical properties of soil. Contributes to provision of irrigation water by 35% -50%. It provides and maintains the necessary nutrients for plants and limits their leakage to the depths of the plant roots. Available in granular size (08- mm), packs of volume 1 cubic meters to 50 liter, 25 liter and 10 liter bags. Or according to consumer demand.

Organic ZeoFarm

This product is made of natural zeolite with organic fertilizer in certain proportions, used in fertilizing soil with nutrients and used in organic agriculture. Contributes to provision of irrigation water by 35% -50%. It provides and maintains the necessary nutrients for plants and limits their leakage to the depths of the plant roots. Available in granular size (08- mm), packs of volume 1 cubic meters to 50 liter, 25 liter and 10 liter bags. Or according to consumer demand.

ZeoFeed

Add with feed mixtures to feed poultry, sheep, cows, camels and horses. It is available in granular size of (00.5- mm). It is available in packs of volume 1 cubic meter to 50 liter, 25 liter and 10 liter bags. Or according to consumer demand.

Natural ZeoClean Mattress

Used in poultry and animal farms. Available in granular size (08- mm). It is available in packs of volume 1 cubic meter to 50 liter, 25 liter and 10 liter bags. Or according to consumer demand.

Odors Natural ZeoClean

Control Odors used in the absorption of smells and uses of cats, dogs and pets domestic animals and is available in granular size from (0.5 - 4.0 mm). It is available in packs of volume 10 liter and 5 liter bags. Or according to consumer demand.

Natural ZeoClean Filter

Purification, Filtration Swimming Pool waters, available in granular size from (0.5 - 0.8 mm). It is available in packs of volume 1 cubic meter to 50 liter, 25 liter and 10 liter bags. Or according to consumer demand.

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JORDANIAN ZEOLITE IS THE BEST NATURAL ZEOLIT

Jordanian natural zeolite consists of several basic minerals from the natural zeolite minerals group, it considered as the best minerals of the group because it has high quality properties and characteristics that distinguish it from the rest of the zeolite minerals group.

How is the Jordanian Zeolite Formed?

Natural Jordanian zeolite is formed by the interaction of volcanic rocks and volcanic ash layers with alkaline groundwater, natural zeolite minerals have crystallized in post-precipitation environments at intervals between thousands and millions of years in shallow marine ponds, zeolite contains a porous structure that can accommodate a wide range of cations such as Na+, K+, Ca+2, Mg+2 and more.

What are the Jordanian Zeolite Minerals?

The Jordanian zeolite is composed of the following group of natural zeolite minerals: Phillipsite, Chabazite, and Analcime, which are characterized by high-quality properties and very useful in the agricultural, industrial and environmental fields, while most of the global production of zeolite is made from Clinoptilolite mineral.

Zeolite Minerals%	B.H. 1	B.H. 2	B.H. 3	B.H. 4	B.H. 5	MIN	MAX	Average
Phillipsite	32.9	37.8	41.1	39.4	32.2	32.2	41.1	36.7
Chabazite	13.3	16.8	6.3	17.2	18.4	6.3	18.4	14.4
Analcime	8.1	5.5	9.7	0	5.2	0	9.7	5.7
Total	54.3	60.1	57.1	56.6	55.8	54.3	60.1	56.8
Non Zeolites	Volcanic glass (palagonite), olivine, plagioclase, pyroxene, iron oxides, smectite clays, calcite, organic matter and cellulose							

The analyzes were carried out in the laboratories of the Energy and Mineral Resources Ministry and Turkish ARGETEST laboratories.

Sam No.	Ph	He	Cc	An	F	Fa	Ch	Sm	G
BH1	***	*	*	**	***	**	**	*	-
BH2	**	*	*	**	***	*	**	*	*
BH3	***	*	*	**	***	*	***	*	-
BH4	***	*	*	**	***	*	***	*	-
BH5	***	*	*	***	**	*	***	*	-

Ph-Phillipsite, He-Hematite, Cc-Calcite, An - Analcime, F-Feldspar, Fa-Faujasite, Ch: Chabazite, Sm-Smectite, G-Gypsum, Major: ***, Minor: **, Trace: *

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What are the advantages of jordanian zeolite from other zeolites?

Jordanian zeolite is distinguished with high quality specifications from other zeolite products available on the market, especially Clinoptilolite zeolite products. The most important of these are as follows:

1- Ion Exchange Capacity:

The minerals that make up the Jordanian zeolite are superior to all other types of zeolite minerals, especially the Clinoptilolite mineral, as the ion exchange capacity of the Jordanian zeolite ranges between (CEC = 44.5- meq / g) while Clinoptilolite (CEC = 2.2 meq/g) That is, the Jordanian zeolite minerals have twice the CEC of Clinoptilolite as shown in the following tables:

Physical characteristics of some naturally occurring zeolites (Doğan, 2003)

Zeolite	Porosity [%]	Heat stability	CEC [meq/g]	Specific gravity [g/cm^3]	Bulk density [g/cm^3]
Analcime	38	high	4.54	2.24	1.85
Chabazite	47	high	3.84	2.05	1.45
Clinoptilolite	34	high	2.16	2.15	1.15
Faujasite	44	high	3.96	2.25	1.45
Erionite	35	high	3.12	2.02	1.51
Heulandite	39	low	2.91	2.18	1.69
Mordenite	28	high	4.29	2.12	1.70
Phillipsite	31	moderate	4.31	2.15	1.58

The following table shows low CEC values of Clinoptilolite of Iranian, Turkish, Chinese and other countries zeolite products.

CEC Properties of Various Forms of Natural Zeolites		
Zeolite	CEC [meq/g]	References
Clinoptilolite	102	Alvarez-Ayuso et al. (2003)
Synthesized zeolite – NaPI (from fly ash)	195	Alvarez-Ayuso et al. (2003)
New Zealand Clinoptilolite	88.2–113	Bolan et al. (2003)
Iranian Clinoptilolite + mordent	120	Ghiaci et al. (2004)
Croatian Clinoptilolite	145	Farkas et al. (2005)
Chilean Clinoptilolite	105	Englert and Rubio (2005)
Italian Phillipsite + Chabazite	212	Capasso et al. (2005)
Turkish Clinoptilolite	95.1–141	Karadag et al. (2006)
Chinese Clinoptilolite	52.2	Sprynskyy et al. (2006)

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2- Chemical components:

The main chemical elements of the Jordanian zeolite analyzed as shown in the following table:

Parameters	MIN	MAX	Average
SiO2 %	38.9	43.6	41.3
Al2O3 %	10.2	14.1	12.1
Fe2O3 %	12.8	14.4	13.6
CaO %	8.3	12.7	9.8
MgO %	4.2	9.0	7.1
K2O %	0.7	2.5	1.7
Na2O %	0.1	4.1	2.0
TiO2 %	2.6	3.1	2.8
P2O5 %	0.8	1.2	0.9
MnO %	0.2	0.2	0.2
SO3 %	0.0	1.0	0.2
LOI %	5.2	10.8	8.5
Mo ppm	1.3	4.9	2.4
Cu ppm	26.2	46.2	36.3
Zn ppm	84.8	418.3	149.4

The essential nutrients elements necessary for plants growth found in Jordanian zeolites that have been analyzed as shown in the following table:

Essential Elements	P %	K %	Mg %	S %	Ca %	Fe %	Mn ppm	Cu ppm	Zn ppm	Mo ppm
Average	0.3	1.3	3.5	0.1	4.9	7.0	0.1	36.3	149.5	2.4

There are ten essential nutrients in Jordanian zeolite that are necessary for plant growth. These elements act as a natural fertilizer that nourishes the plants with the essential elements needed for growth. As for the rest of the other essential elements, N, O, H, C, they are available in water and air.

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3- Acidity values

The pH values of Jordanian zeolite range from 7.08.0- degrees, which is very suitable for adjusting the acidity of agricultural soils and reducing the impact of chemical fertilizers that increase the acidity of the soil, when adding it to agricultural soils, it equates the soil pH. While Clinoptilolite has pH values below 6, which are acidic and do not reduce soil pH.

4- Physical properties

The following table shows most of the physical properties of Jordanian zeolites

Parameters	Range
pH	7.0 - 8.0
Color	Reddish to dark brown
Water absorption (%)	10.8
Abrasive value (%)	52
Unit weight (kg/m^3)	1010
Specific gravity (g/cm^3)	1.90
Void ratio	30
Porosity (%)	35
Loss on Ignition (%)	16
CEC (meq/g)	4.6
Surface abrasion (mm)	28
Soundness (%)	9
T.D.S. (ppm)	1250-1500

PH: The pH is the measurement that determines whether a liquid is acidic, basic, or neutral. Liquids with a pH less than 7 acids and liquids with a pH higher than 7 alkaline solutions or bases.

5- Mineral content

In addition to the presence of different zeolite minerals in Jordanian zeolite, the supplemental content of zeolite also includes Volcanic tuff with is similar to zeolite minerals in terms of porosity, permeability, and mineral nutrients necessary for plant growth and improvement of chemical and physical properties of agricultural soils and wastewater purification, and in the cement industry.

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Characteristics Of Jordanian Zeolite?

- Jordanian zeolite is a natural product with unique mineral, chemical and physical properties which available in Jordanian zeolite only.
- Jordanian zeolite produces a highly effective fertilizer useful for the soil in the intensive cultivation of fruits, vegetables and flowers and promotes plant growth effectively because it contains essential nutrients necessary for the plant.
- Jordanian zeolite is specially designed for mixing with fertilizers, especially organic fertilizers.
- Jordanian zeolite is also considered a natural protection of groundwater fro contamination of leachate fertilizers to groundwater.
- Jordanian zeolite is produced in a granular form suitable for all different uses, especially agriculture sector.



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Why the Jordanian zeolite?

We provide the highest quality natural Jordanian zeolite in the world for the following reasons:
There are seventeen reasons why Jordan's zeolite is better than any other zeolite.

- Jordanian zeolite is 100% natural, free from toxic elements and pesticides, it has no negative side effects on plants and any danger or side effects on animal and human health.
- Jordanian zeolite contains natural zeolite minerals in rates ranging from 4060%-.
- Jordanian zeolite is purer, lighter in weight and multicolored and is found in several degrees of low, medium and high hardness.
- Jordanian zeolite saves 3035%- of the fertilizers added to the soil.
- It provides about 50% of the plants 'need for irrigation water and increases water retention in the root zone.
- It is characterized by a very high ability to maintain the nutrients necessary for plant growth in the soil and improves the structure, ventilation and performance of the soil.
- It treats the salinity and disposal of agricultural soils and improves nutritional balance in various types and varieties of soils.
- Increases plant resistance to drought stress and disease.
- It prevents plants from absorbing dangerous heavy metals from the soil.
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- It increases feed susceptibility to animals by acting as an anti-clumping agent and improves homogeneous fodder disintegration while mixing and ingesting feed.
- Increases daily growth and weight by improving feed conversion efficiency to increase healthy growth and development of bone tissue and structure.
- It absorbs all types of toxins and heavy metals if they are found in animal feed, zeolite helps in the disposal of animal waste.
- It improves bacterial activity in ruminants to enable animals to take advantage of the nutrients available in the feed and absorb gases and ammonia from the digestive system.
- It contributes to raising the percentage of production in the amount of eggs in poultry and strengthening the egg shell.
- It strengthens the immune system in animals against many dangerous diseases and reduces the occurrence of diarrhea and the problems caused by the animal's digestive system.
- It reduces the emissions of ammonia from animal feces and prevents the occurrence of wet litter, thus improves air quality in animal pens.
- It prevents plants from absorbing dangerous heavy metals from the soil.
- Jordanian zeolite saves 30 - 35% of the fertilizers added to the soil.
- It treats the salinity and disposal of agricultural soils and improves nutritional balance in various types and varieties of soils.
- It continues to grow in agricultural soil for a period of not less than 10 years.
- Jordanian zeolite contains natural zeolite minerals in rates ranging from 4060%-.

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